**Polarization of Light**

An electromagnetic wave is a transverse wave in which both the electric and magnetic fields are perpendicular to each other and to the direction of propagation of the wave. A single vibrating electron emits an electromagnetic wave that is **plane-polarized** - the electric field vectors all lie in one plane. (For simplicity we will only look at the electric field vectors but there is a magnetic field vector created at right angles to the electric field vectors.)

vibrations are vertical

y

x

z

direction of wave propagation

A common light source such as a fluorescent lamp, candle flame, or the Sun emits light that is unpolarized - the electric fields exist in more than one plane.

This filter is oriented so that only waves vibrating in a horizontal plane will pass through; the vertical components will be absorbed.

horizontally

polarized light

unpolarized light

polarizing filter

What will happen when two filters are arranged so that their axes of polarization are 90° to each other?

2nd polarizer is horizontally oriented

1st polarizer is vertically oriented

unpolarized light

How does the fact that light can be polarized show that it must travel as a transverse wave and not a longitudinal wave?

Polarized sunglasses absorb **glare** from a road, lake, or hood of a car. When light strikes a flat non-metallic surface, it is reflected so that it is polarized mainly in a plane parallel to the surface.

How should the filters in the glasses be oriented to block glare?

Light striking a horizontal surface will be reflected so that it is partially polarized in the horizontal plane.